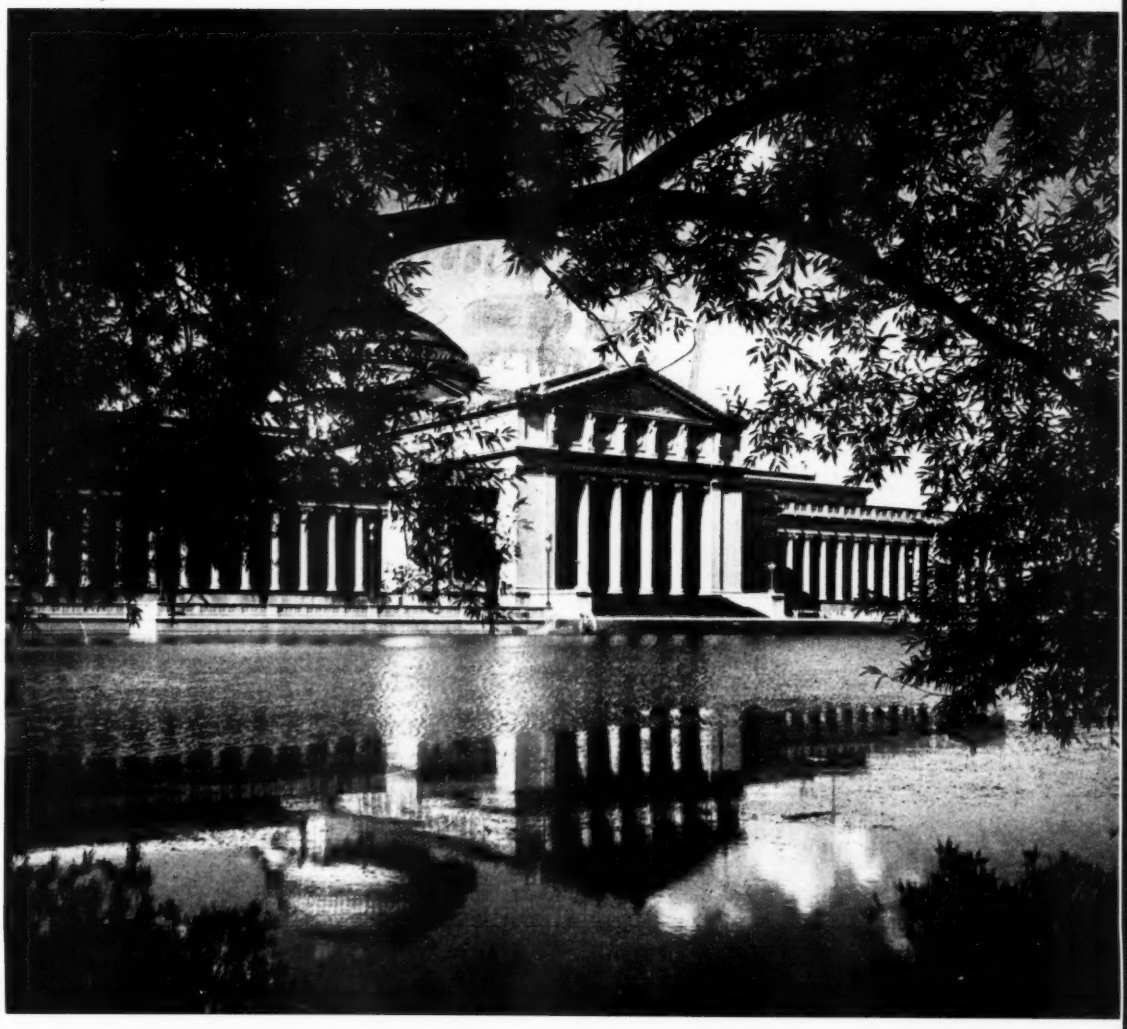
Midwest Engineer

SERVING THE ENGINEERING PROFESSION



WESTERN SOCIETY OF ENGINEERS FOUNDED 1869

TRANSPORTATION IN CHICAGO—PAGE THREE

WSE MEETINGS—PAGE TWO

Vol. 5 SEPTEMBER, 1952 No. 4

CONCRETE
Barrel Shell Roofs provide large column-free areas

CONCRETE barrel shell roofs are ideal for buildings requiring large interior areas free from obstructions. This type of construction offers these distinct advantages:

1. Long spans—up to 300 feet and more—without supporting columns.
2. Maximum usable floor space.
3. Adaptability to a variety of plan requirements.
4. Unusual economy in large structures.
5. Firesafety, low insurance and long life.

This design was chosen for the New York City Fire Department's new repair shops (shown above) in Long Island City, N.Y. The central interior portion of the building has an unobstructed area, 121 x 490 feet, with 35-ft. clearance from floor to crown of roof. Side walls are 12 ft. high at the springing line.

Along both sides of the structure are two full-length lean-to's, spanned by 39-ft. concrete barrel shell roofs. These lean-to's provide space for woodworking, foundry, upholstery and other shops. At the ends of the building, two-story conventional beam and slab type sections for office and storage space complete the structure that was designed by the Bureau of Architecture, New York City Department of Public Works, and erected by Corbetta Construction Co. Roberts and Schaefer Co., Chicago, were the engineers.

The exterior rib construction makes possible a smooth interior ceiling. At the crown the roof is only 3¾-in. thick.

Wherever large, column-free floor areas are essential—such as in train sheds, railroad repair shops, warehouses, auditoriums, airplane hangars, sports arenas and gymnasiums, produce markets, big garages and monumental buildings—concrete barrel shell roofs are the economical answer.

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Serving the Engineering Profession

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Cover Story

The picture on the front cover of this issue is of the Museum of Science and Industry, Chicago home of the 1952 Centennial of Engineering. The Museum was also the home of the musical, "Adam to Atom," which entertained many conventioning engineers and others in Chicago.

The Society's organization for the current year has been completed and is functioning, and the Executive Committees of the various sections have been elected and have named their officers. All committee chairmen have been appointed and have either completed or are in the process of naming the personnel of their respective committees. The Program Committee is, in cooperation with the various sections, scheduling the dates for meetings throughout the fiscal year.

Following are given the dates of the General and Sectional meetings, and the Weekly Noon Luncheon meetings. As yet the speakers and their topics are unavailable, but they will be announced as soon as they are available by post card or on this page.

October 20, Section Meeting
October 22, Noon Luncheon Meetings
October 27, General Meeting
October 29, Noon Luncheon Meeting
November 3, Section Meeting
November 5, Noon Luncheon Meeting
November 10, General Meeting

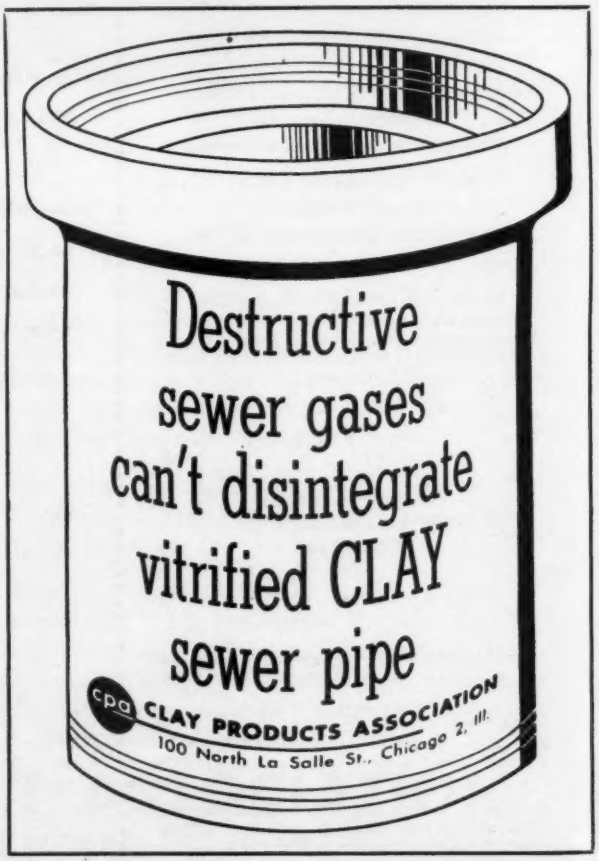
The Secretary's office is set up to serve you, and your requests for any service which the Society may furnish you will be welcomed.

WSE Announces New Meeting Policy

The Western Society has a new policy regarding the Monday evening meetings. General meetings, comparable to those meetings held during previous seasons, will be held on the 2nd and 4th Mondays of each month.

Meetings of the various sections, divisions and councils will be held on the 1st and 3rd Mondays of each month.

Besides being urged to attend the General meetings, each member is invited to attend the meetings of his own section, and those of other sections.



Transportation in Chicago

By Virgil E. Gunlock

In discussing the subject of transportation in Chicago, I will divide it into five natural classifications as follows:

1. WATER
2. RAIL
3. TRANSIT
4. HIGHWAY
5. AIR

I realize that there are many subdivisions of these classifications and in some instances rather serious overlapping, but for the purpose, I believe that this is sufficient division of the subject.

Water

Probably the first form of transportation of any importance in moving people and goods in the Chicago area was water transportation. In the beginning this may have been by use of canoes or other crude boats or rafts, but there soon developed a commerce on the great lakes and along the adjacent river system which was very important to the future development of Chicago. Situated as Chicago is at the south end of Lake Michigan and at the mouth of the Chicago River, it naturally was a city dependent on water borne carriers for its commerce and contact with the outside world. The Chicago River also gave it access to the Desplaines-Illinois Mississippi River System which connected it with the heartland of America and the South and West.

One of the earliest engineering projects in this area was the construction of the portage road leading from the Chicago River to the Desplaines River. It was interesting to me in the construction of the Harlem Avenue Bridge in 1931, to find remains of this old portage road which had been used more than 100 years before.

The next major transportation project to be undertaken was the construction of the Illinois-Michigan Canal which was authorized in 1822 and was started in 1836. It was completed about 12 years later. It extended from the Chicago River in the vicinity of 24th Street and Ashland Avenue to Peru, Illinois on the Illinois River, a distance of about 100 miles. Where excavated the canal was 60 feet wide at the water line and 30 feet wide on the bottom with a water depth of 6 feet. In addition to the 60 foot canal width, there was a 90 foot wide reserve on each side for tow paths and other uses. Building this canal was an engineering feat in its day, and had great promise of being a major transportation artery. However, it was soon to feel the competition of the railroads, and after the Civil War was used less and less until finally it fell into complete disuse about the end of the nineteenth century.

Engineers are now trying to utilize the right-of-way which was reserved for this canal for an ultra modern superhighway.

Because the Illinois-Michigan Canal was not successful does not mean that a waterway in this general locality was not needed, and we have since seen developed the great Sanitary Canal and Illinois Waterway which today handles millions of tons of river traffic. Added to this system is the Calumet Sag Waterway which is also very important in river borne transportation.

Attesting to the importance of lake borne and river borne transportation is the fact that last year there were 49 million tons of lake borne traffic and 18 million tons of river borne traffic. Import-

(Continued on Page 4)

This talk was given by Mr. Gunlock before the Western Society of Engineers on September 4, 1952 at WSE Headquarters. Mr. Gunlock, who is a member of WSE, is the Commissioner of Public Works for the City of Chicago.

(Continued from Page 3)

ant engineering projects have been designed and built to handle this traffic. Among these being the Navy Pier, the Sanitary Canal, the Sag Canal, and the locks and controls in the river system that are necessary to make this function. Part of this work was not done primarily for transportation, but was rather a part of another great engineering project, namely, the development of sewage disposal facilities for the Chicago area. Projects are now being planned which will greatly enhance the importance of Chicago as a water transport center. These are the St. Lawrence Seaway, the improvement of the Calumet Sag Waterway and the improvement of the Calumet Lake harbor district. Water borne transportation in this area has increased in recent years and with these new improvements which will surely come about, there is every indication that it will gain added importance in the future.

Rail

One hundred years ago the railroads were just starting to enter the field here. In 1850 the Chicago and Northwestern Railroad was building its line from Chicago to Galena and the Rock Island, Michigan Central and Illinois Central were about to start building.

After this came the great era of railroad expansion which contributed so much to Chicago's rapid growth and prosperity.

Chicago became the railroad center of the world. The railroads now carry about 125 million passengers per year into and out of Chicago.

From the freight standpoint the picture is equally massive. We have the Chicago Terminal District, an area of 1,750 square miles. It extends for a radius of aproximately 40 miles from Chicago's "Loop" to Waukegan on the north, Joliet on the southwest and beyond Gary, Indiana, to the east. The total mileage of track is 7,869 miles, combining main line, switching and sidetracks. Nineteen trunk lines, seven belt and switching, eight industrial and three electrical railways operate within the Terminal. Here, also, are located 206 freight terminals and industrial yards with a normal capacity for spotting 206,820 railroad cars of every description, 225 freight houses, 372 team yards and several hundred specially constructed yards for handling coal.

This development of rail transportation was one of the greatest engineering accomplishments of all time. From 1850 to 1926 engineers were busy building bridges, grade separations, terminals, tracks and equipment. Since 1926 the emphasis has been more on the improvement of power and equipment and less on structures.

The railroads are now experiencing very acute competition from other and newer forms of transportation. Their answer to this is better equipment, faster service, greater comfort and improved safety. Railroad engineers have a challenging task to develop further improvements which will keep this great industry in the important position which it now holds in our transportation picture.

Engineering projects which many think should be undertaken now by the railroads are smoke abatement, extension of grade separations, rebuilding of many old structures, improvement of freight facilities, and consolidation of passenger terminals.

Transit

One hundred years ago Chicago was a city of around 30,000 inhabitants, who depended solely on the horse or "shanks mare" for their local transportation. The only vehicles were the hack, the dray, the wagon and the surrey with the fringe on top.

Among these people was a young civil engineer, Col. Roswell B. Mason, who by the way was a charter member of the Western Society of Engineers and its first president. Col. Mason obtained the first franchise for horsecar operation in Chicago in 1856. A short piece of track was laid, but due to the panic of 1857 nothing came of the venture immediately. However, it was revived in 1859 and the first line put in operation. It ran up and down State Street from what is now the "Loop" to somewhere beyond 12th Street.

Those first street cars were 12 feet long, seated 18 passengers and made about 3 miles per hour. The fare was five cents. It was a one-man operation, he being the driver of the horse. The passenger entered by a rear door, where he dropped his nickel in a sort of trough and it slid down to the driver, who was also the conductor. The cars were unheated in winter and when light was required it was furnished by oil lamps.

By 1870 the city had added another 200,000 population and the street cars were operating in all directions. But the 12-foot one-horse car was no longer sufficient to its purpose and a new double-end car drawn by two horses was put in operation. Its capacity was 30 passengers. And it had the luxury of a conductor.

By 1880, the city had passed the half million mark in population and it had 155 miles of street car track.

Horses were too slow now and the cablecar made its appearance. This introduced the train, a grip car and trailers, each trailer with a capacity of 20 passengers. A device in the grip car gripped a cable which lay in a slot between the car tracks. Power stations along the line pulled the cable over rollers. The driver stopped the car by releasing the grip and applying brakes. Speed in the downtown area was a little better than eight miles an hour and if the track was clear, the driver zipped it up to 12 miles in the area outside the more conjested business districts.

Plenty of trouble was experienced in winter when snow or ice collected in the slot and froze up the cable system. To overcome this, steam pipes were laid in the slot and hot steam forced through them from a boiler which was hauled around to the spots that were in trouble.

Statistics at hand show that in the early 90's, Chicago had 86 miles of cablecar track and 234 miles of horse car track. On the cablecar lines there were around 500 grip cars and more than 1,700 trailers in operation.

About this time experiments were made with steam drawn cars and compressed air drawn cars, but they were not too successful. An electric trolley in a cable slot was tried and also storage battery cars, and finally the overhead trolley. This proved most successful and the changeover from cable and horsecars began in 1890. By 1906 the last of the cable cars were withdrawn and the city boasted of nearly 600 miles of overhead trolley car track.

In 1890 the elevated system appeared on the scene. The first trains were pulled by steam locomotives, but by 1898 the latter were displaced by electric motor cars. An elevated electric railway had been built at the World's Fair in 1893.

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The Welcome Sign Is Out For Women Engineers

By William V. Kahler

We of Chicago's engineering profession are honored that our City is host to this great Convocation of Engineering that began yesterday. And I would like to take this opportunity to echo the hearty words of welcome that are being extended from many rostrums to the thousands of out-of-town engineers who are here to participate in the 100th Anniversary of the establishment of Civilian Engineering as a group separate and apart from the purely Military Engineering which preceded it.

Also, we in Western Society are honored to have as our guests today many members of the Society of Women Engineers. It is indeed fitting that these women members of our profession, who have formed what is perhaps the *newest* engineering society in America, are here to take an active part in this centennial celebration of the *oldest* engineering society—the American Society of Civil Engineers.

It's fitting, too, that the keynote of both SWE and WSE in their convention meetings is "Women Engineers." I wouldn't want to take one whit of interest away from the programs being presented by the 60 or so other engineering societies meeting in Chicago, but I doubt that any of them have chosen a subject that's half so fascinating!

Seriously, I have the highest regard for the engineering talents of these women who today are making significant contributions to America's science and industry. I only wish there were *more of them!*

Some people—and I'm afraid there may even be engineers among them—still feel that women have only a very limited place in the engineering profession. In my opinion this is a mistaken appraisal. It is not realistic in today's modern industry where we need to encourage creative engineering talent *wherever* it may be . . . and regardless of whether or not that talent belongs to women or men.

While it can't be proved, I suspect it was a woman who, trying to soothe a crying baby, first got the idea of fitting crude rockers onto a primitive cradle. A rocker is almost half a wheel . . . and the wheel has been called man's first great engineering triumph. For my part, I can't escape the thought that perhaps we men have received credit for some of civilization's mechanical achievements that rightfully belong to women, or at least to women's persistence that we contrive all sorts of things to give them more time for leisure and conversation.

It is true, of course, that in nearly all the professions today, women are greatly in the minority. In the case of engineering, however, the disparity between men and women is greater than in any other profession. In fact, it has been estimated that only 3 out of every thousand engineers are women; whereas in the legal profession, for example, the ratio is close to 40 out of every thousand, and in the medical profession the ratio is about 30 out of every thousand.

Why is it that comparatively few women have chosen to enter the engineering profession?

Perhaps one of the reasons is that, in the minds of many people, the word "engineer" calls forth a mental picture of a rugged, athletic-looking man dressed in explorers' clothes standing amid piles of rubble and above the noise and confusion of some big construction project, confidently giving orders to an army of workers.

It's only natural that most non-engineers—among them the fathers and mothers to whom their children look for advice in choosing a career—cannot imagine women fitting into such a picture. And, to be frank about it, if that were my mental picture of engineering work, I don't suppose I could either!

However, as engineers, you and I

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Mr. Kahler, Past President of WSE, gave this talk to the Western Society of Engineers on September 4, 1952. Mr. Kahler is President, Illinois Bell Telephone Company, Chicago.

(Continued from Page 5)

know that in today's engineering world there are many more millions of man-hours spent doing purely engineering work at desks and drafting boards than are spent in the field translating this work from blue prints into reality!

For example, I read somewhere that it took nearly 3 million engineering man-hours to get a recent new model of a jet fighter plane from the dream stage to the flying stage! In the telephone busines, with which I am a good deal more familiar, a single project to convert a manual telephone office to a dial operation in a city like Chicago requires over 25,000 engineering man-hours. And that doesn't include the many thousands of hours of engineering work spent in the original development of the equipment.

The idea that, because of the very nature of the work, engineering is almost exclusively a man's profession, is a strong deterrent to young women who might otherwise take up engineering careers. Whatever the reason for women's lack of interest, these figures certainly dramatize the fact that it does exist.

In our engineering colleges . . . just last year . . . there were 260 men enrolled for each woman enrolled. By contrast, in two other well-known professions—law and medicine—last year's ratio was 25 men to each woman enrolled in law, and 17 men to each woman studying medicine.

Thus proportionately, there were more than 10 times as many women enrolled for legal careers, and 15 times as many seeking to become doctors, than there were young women seeking engineering as a profession.

When it comes to engineering *graduates,* the ratio of men to women doubles: 260 to one enrolled and 543 to one graduated. The ratio of women to men graduates in law and medicine last year, however, remained almost the same as the ratio of those enrolled.

I might point out, however, that there is a bright spot in a technical field closely allied to engineering, where the proportion of women receiving college degrees is gratifying. I'm referring to the field of mathematics where—in 1948-49—30 per cent of the graduating classes were women. The following year, women comprised nearly 23 per cent of the total among mathematics graduates.

Getting back to the subject of women engineering students, I strongly suspect the very fact that women are so overwhelmingly outnumbered by men students is in itself discouraging to young women who might look upon engineering as a desirable profession. Undoubtedly, many a young woman engineering student has felt "cut off" from the other girls because she, alone, was studying engineering, and consequently changed her course. Thus, the natural talents and interest that led her to originally enroll in engineering are diverted into other fields—and our profession is the loser. Perhaps our schools, in addition to encouraging more qualified young women to take up engineering careers in the first place, might make a greater effort to persuade them to continue once they are enrolled.

All of us here are well aware that there is an acute shortage of engineers in the United States today. Our professional journals have all carried articles highlighting the seriousness of this shortage. It is estimated that right now, American industry needs at least 60,000 more engineers, and can absorb 30 to 40 thousand new engineering school graduates each year. And this doesn't include the 15 thousand or so engineers taken by the military each year!

Contrasted to this need, only about 26,000 were graduated from our engineering colleges last year. As a matter of fact, even 1950's record graduating class of 52,000 engineers was not enough to meet the demand at that time. Present school enrollments indicate that by 1954 there may be only a scant 12,000 engineering graduates!

Thus, we are confronted with a potential engineering manpower shortage that is rapidly developing into critical problem proportions.

Historically, it has always taken a time of crisis to provide women with the incentives and opportunities to enter new professions in any considerable numbers. With both our civilian and military engineering establishments literally crying for people, the opportunities for women taking up engineering careers have never been better, and it is to be hoped that they will seize upon them to the ultimate benefit of our science and industry.

Recently, I've been conducting a personal—and I must admit, non-scientific—poll to satisfy myself concerning the job opportunities for women engineers. I can report that I have yet to hear of a single qualified woman engineer who was looking for a job, unless it was a better one!

With far too few engineers being trained in our colleges, we in the engineering profession and those in our technical schools and colleges, even more than any other group of people, have a responsibility to encourage—and yes, even recruit—young people to take up engineering careers.

In carrying out this responsibility, we should not overlook a great source of potential engineering talent, that possessed by many young women.

For example, just a few weeks ago, I saw in a Sunday newspaper an interesting story about a 14 or 15 year old girl who was a model airplane contest winner. The story told about how she had been designing and building her own model planes for several years, and that even though she was outnumbered by the boys, her airplanes gave them mighty tough competition.

This girl, it seems to me, has already proved at an early age that she possesses many of the special capabilities and interests needed to make a highly successful engineer. Certainly, she seems to have them in as high a degree as the boys she competes against.

Perhaps this girl may choose to enroll in an engineering school without anyone urging her to do so. But think how much better her chances of doing so would be if an engineer—perhaps a friend of the family—took the time to point out to her and her parents the opportunities, and the interest and importance of this great field.

It is in precisely this field of interesting qualified young women to take up engineering as a career, that our mature women engineers can make great contributions, not only to their own cause, but to that of our profession as a whole.

You women who are doing such a magnificent job of organizing your professional societies have a great opportunity and challenge. In a sense, even

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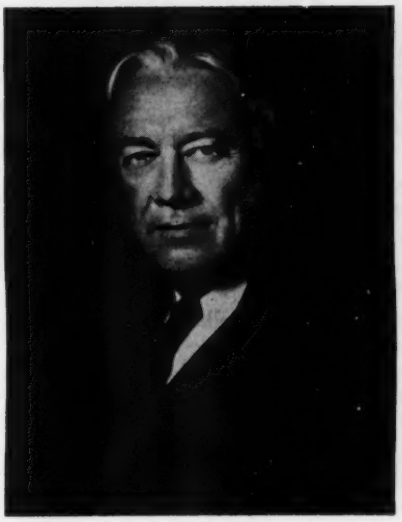
Water Works Developments in The Chicago Area



By L. R. Howson

As the oldest engineering society in the United States celebrates the one hundredth anniversary of its founding, so the Chicago Water Works marks the one hundredth anniversary of its beginning of operation as a municipal utility.

Possibly it might be well to go back still further in appraising the progress that has been made in the Chicago water works. It was on August 12, 1833 that the Board of Trustees of Chicago held its first meeting. The unincorporated community had been afflicted with a cholera epidemic a year previous. Although the cause of the fever was stated by Dr. Daniel Drake to have been the plowing up of the prairies, he did stress that cleanliness and sanitation were contributing factors. Two years later in 1835 a Chicago Board of Health was created. In 1836 the Illinois-Michigan Canal, which diverted some of the sewage from the lake, was started. It was completed in 1848.

A private water company called "The Hydraulic Company" was chartered in 1840 to furnish water for Chicago. The supply was taken from Lake Michigan about 600 feet off-shore. The plant developed but little and in the eleven years of its existence had only one 25 H.P. pumping unit and two miles of wooden pipes. It served but a relatively small area and few consumers.

In 1853, when the City of Chicago took over the private plant by an act of the legislature, the City had a population of 30,000 and an area of 14 square miles. In the intervening one hundred years the population served by the Chicago Water Works has increased to 4,147,000 and the area within the city limits to 212 square miles. In 1950 approximately 12% of the population served and 7% of the water sold was to areas outside of the city limits.

By 1889 the area within the city had grown to 43.8 square miles. In that year annexations including Hyde Park and Lakeview increased this area more than fourfold to 187.1 square miles. Additional annexations of Pullman, Washington Heights, Norwood Park and Rogers Park in the next four years added materially to both area and population served.

A three-year typhoid epidemic about 1890 which resulted in nearly 4500 deaths led to the passage by the Illinois State Legislature of the Sanitary District Act of Chicago in 1889. The works of this District in the next two decades reversed the flow of the Chicago River, diverted sewage outfalls from the lake to the river and drainage canal, and materially improved the quality of the water supply.

This 1889 Act creating the Sanitary District of Chicago included a provision that outlying communities included within the limits of the Sanitary District of Chicago should have access to the Chicago municipal water supply at the city limits at the same rates and under the same conditions as the residents of the City of Chicago. Under this provision, such villages and cities as Oak Park, Berwyn, Cicero, Harvey, Riverside, Brookfield, Maywood, Melrose Park, and others which originally had well supplies and which had a total population in excess of half a million people in 1950 are now served with Chicago water.

As shore pollution increased, the City of Chicago secured a better quality of water by continually going far out into the lake with its intakes. Smaller communities could not afford this construction. This fact resulted in some of the early filtration plants of the country being installed in the Chicago area, the first of which was an installation of American filters of the pressure type

(Continued on Page 8)

Mr. Howson presented this talk before the Western Society of Engineers on September 4, 1952. He is a partner in the firm of Alvord, Burdick, and Howson, Chicago.

(Continued from Page 7)

in 1889 by a private water company serving Rogers Park. Other early filtration plants on the Great Lakes were installed at Kenilworth and Lake Forest.

A major improvement in the Chicago water supply resulted from the introduction of chlorine or chlorine compounds for sterilization. The experiments of Jennings at the Union Stock Yards Filtration Plant in 1908, treating the grossly polluted Bubbly Creek water, established the efficiency of calcium hypochlorite for water sterilization. In November of that same year Lake Forest installed chlorination and other nearby cities followed. Chlorination of the Chicago supply was started in 1912 and by 1917 the entire supply was chlorinated.

The well waters of the Chicago area are relatively hard. Initially deep wells in the Chicago area flowed as much as 100 feet above the ground surface. Heavy pumping has lowered the water level in these sandstones to approximately 500 feet below ground surface at the present time which is largely responsible for many of the suburbs turning to the Chicago Water Works. Some of the suburban communities still using well water largely from the Niagara limestone, whose water level has remained relatively constant, have installed softening plants. The first municipal softening plant in this area was built by the Village of Hinsdale about 1912. Others have since been installed at Western Springs, LaGrange and Des Plaines.

Illustrative of the growth of water works systems in Illinois in the past century, records show there was but one public water supply in 1850 with no more added until 1866. In 1900 there were 289 public water supplies and in 1950 there were 730. As of the present time 98% of the urban population of the state is served by its 730 public water supplies. Only one city with a population of over 1,000 in the State of Illinois is now without a public water supply.

The story of the development of the Chicago water supply parallels that of its unprecedented population growth. The development of each part of the Chicago water system is a story in itself.

SOURCE OF SUPPLY

From the beginning the Chicago water supply has been drawn from Lake Michigan, first through the shore intake extended from the Chicago Avenue Station at the site still occupied by the pumping station of that name 600 feet into the lake. This soon proved unsatisfactory, and Chicago started its long time policy of drawing the water at greater distances from shore in order to improve the quality. The two mile 5-foot tunnel and crib construction to serve the Chicago Avenue Station was completed on March 25, 1867. The capacity of this tunnel soon became insufficient and on July 12, 1872, construction was started on another 7-foot tunnel from the two mile crib to the Chicago Avenue Station with an extension southwest by land to a second pumping station located on 22nd Street. These lake and land tunnels were both completed in 1874.

By 1886 the two tunnels became inadequate and a third, also 7 feet in diameter, was built from the Chicago Avenue Station to a temporary crib 1500 feet from shore. This tunnel was extended in 1891 to the northeast government end of the breakwater and in 1895 to the two mile crib.

In addition to the threefold enlargement of the two mile crib intake tunnels in a twenty year period, the Chicago water supply system was rapidly being expanded by the construction of other intakes.

The Village of Hyde Park built its first intake of cast iron pipe in 1873 and its first water tunnel in 1884 and 1885. After annexation to Chicago in 1889, this intake tunnel was extended by the city in 1892 primarily to supply water for the World's Columbian Exposition. It was extended again in 1894.

The Village of Lakeview to the north also took its water initially from the lake through cast iron pipe. When annexed in 1889, the City let a 6 foot tunnel contract, first built 5,000 feet from shore and then extended to 10,000 feet where it was completed and still serves the entire northern section of the City of Chicago.

In 1887, the four mile crib and intake was built to supply the 14th Street,

(Continued on Page 15)

For a good meal any day or every day of the week, Monday through Friday, eat at your WSE dining room.

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Convention Report on the Society of Women Engineers

The entire engineering world honored the American Society of Civil Engineers, and joined with them to celebrate the founding of their Society 100 years ago, by sending representatives to the "Centennial of Engineering—1952." Many long established engineering societies, along with our own 83 year old Western Society of Engineers, and many younger technical organizations paid homage to the first society founded by and for civil engineers.

Without a doubt the youngest organization to participate, as a recognized engineering society, was the recently organized Society of Women Engineers. The Society of Women Engineers was organized on a national basis in May of 1950 and now has eight active sections including the Chicago Section, with three more in the process of formation—one in Texas and two on the west coast.

The Society of Women Engineers was formed with the same ideals and purposes in mind, and the desire to adhere to the engineers' code of ethics, that are the foundation upon which their fellow engineering organizations stand. An additional aim of SWE is to make the public aware of the increased participation of women in engineering and of the potential technical manpower they represent.

Most of the SWE members, and unaffiliated women engineers, arrived in Chicago in time to attend the Western Society of Engineers' convention on Thursday, September 4, as well as the Society of Women Engineers' convention

(Continued on Page 10)

Lillian G. Murad,
President of SWE

Dot Merrill, Chairman,
Chicago Section of SWE

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(Continued from Page 9)

the next day, Friday, September 5, held in WSE headquarters.

The WSE afternoon session and SWE convention's Chicago arrangements were handled very capably and successfully by a committee co-chaired by Lois Graham McDowell, as WSE's Professional Women's Council representative and Dot Merrill, Chairman of SWE's Chicago Section. Both women are members of WSE and SWE. They were ably assisted by WSE and SWE members.

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The program of the Society of Women's Engineers' convention, which follows, demonstrates the versatility and varied fields of activity in which women engineers are engaged.

CONVENTION
SOCIETY OF WOMEN ENGINEEERS

To be held at Society Headquarters of Western Society of Engineers Friday, September 5, 1952 –84 East Randolph St., Chicago, Illinois.

REGISTRATION

9-10 O'clock, September 4, 1952, Thursday AM Headquarters, WSE, 84 E. Randolph St. Chicago.

MORNING SESSION

10 O'clock Auditorium, 7th Floor—Sept. 5 1952.

Chairman

Emma C. Barth, BS (ME), Engineer, Westinghouse Elec. Corp., East Pittsburgh, Penn.

Welcome

Lillian G. Murad, *President, Society of Women Engineers,* Vice-President, Murad Textile Print Works, Inc., New York, N.Y.

Speakers

"One Century of Know-How Challenges the Future", Elsie Eaves, Business Editor, Engineering News Record, New York, N.Y.

"Generation and Distribution of Electric Power in the United States," Marie Reith, ME (IE) Tax Analyst, Consolidated Edison Company, New York, N.Y.

"Civil Aviation Safety", Katherine Stinson, BME, Chief, Specifications Staff, Aircraft Engineering Div. C.A.A.

A question period will follow.

LUNCHEON

12:30 PM—Dining Room, 5th Floor, Headquarters, Western Society of Engineers, 84 E. Randolph St.

Chairman

Mary L. Murphy, Engineer, Illinois Bell Telephone Company, Chicago, Illinois.

AFTERNOON SESSION

2 PM, WSE Headquarters, Auditorium, 7th Floor.

Chairman

Mary Louise Pottle, BS (ME), Sales Engineer, Allis Chalmers Mfg. Company, Boston, Mass.

Speakers

"Behind Jet Transportation Today", Elizabeth M. G. MacGill, BASc. MSE,

(Continued on Page 18)

(Continued from Page 4)

and proved so successful in operation that the discontinuance of the steam locomotive was a foregone conclusion.

By 1926, the elevated system, with over 200 revenue miles, was to reach its greatest importance as a transit carrier to the central district, while the surface street cars, with 1546 revenue miles, carried the bulk of the city-wide transit load, but only slightly exceeded the elevated system in passengers carried to the central district.

In 1926, surface cars carried 296,690 passengers to the central business district between 7 A.M. and 7 P.M. of one day. The elevated system carried 256,286 passengers and automobiles carried 166,367 passengers to the same destination in the same day.

Five years later, in 1931, automobiles had outranked the elevated system and twelve years later had outstripped the surface cars as a passenger carrier to the central district. Automobiles lost this lead during the war years of 1943 to 1945 but quickly regained their position in 1947 and have been steadily gaining since.

The Chicago Transit Authority was organized in 1945 under the leadership of Philip Harrington and this Authority took over operation of the surface and elevated system on October 1, 1947. Under the present leadership of Ralph Budd the Chicago Transit Authority consolidated and modernized the transit system. The Authority now operates 1,679 revenue miles as follows:

Street cars	414	revenue miles
Trolley bus	196	" "
Motor bus	884	" "
Elevated-subway	185	" "

Operating equipment consists of 1,501 street cars, 1,485 elevated and subway cars and a total of 2,122 buses of all types—trolley buses, gasoline buses, diesel buses and propane buses—or a grand total of 5,108 vehicles.

This vast fleet in 1951 carried a revenue passenger total of 736,841,963, with street cars and buses carrying 584,141,163 and elevated and subway carrying 152,700,800.

Another vital carrier in the transportation picture of Chicago is the Chicago Motor Coach Company. This was originally the Chicago Motor Bus Company and formed in 1917. It began operations over a 10-mile route on the north side. It was extended to the south side in 1923 and to the west side in 1929.

At present the system operates over 240 miles with a total of 595 buses. In 1951 it carried 98,891,772 revenue passengers.

The organization of the Transit Authority and the subsequent modernization program has been directed and developed by engineers.

One of the more spectacular engineering accomplishments in connection with local transit is the building of two rapid transit subways. There are the State Street Subway which is five miles long and was completed in 1943 and the Milwaukee-Dearborn-Congress Subway which is four miles long and was completed in 1951. An extension of this latter subway is now being constructed in connection with the Congress Street Expressway. The cost of these three subways will be about 100 million dollars.

The design and equipment of these new subways represents the most modern in engineering development.

While the trend away from the use of mass transit in Chicago and other cities throughout the nation is discouraging to those who must plan transportation, our success in Chicago by modernizing equipment and building additional rapid transit facilities which result in substantial time saving, demonstrates that this trend can be arrested and in some cases actually reversed. Actually, total riding on the rapid transit system has shown only a very slight decrease in the face of this nationwide trend and the modernization of equipment and installation of fast safe subway service has actually caused a very marked increase in transit riding in some areas. Those of us who are close to the transportation problem in Chicago know that mass transit must continue to carry a very substantial part of the passenger load because we have not room, nor can we build facilities, to accommodate all of these people in automobiles. I believe that the future development of the elevated-subway system into a real rapid transit system must go forward so that the people will be convinced that the economy, speed, comfort and safety of transit service is more desirable than the convenience of travel in the private automobile.

Highways

The many layers of pavements which can be found in any street excavation in Chicago show the various designs and materials that have been used through the last ten decades. There is layer after layer of plank, cinders, rubble, stone, macadam, wooden blocks, granite blocks, concrete and asphalt.

After building streets in the mud for

(Continued on Page 12)

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(Continued from Page 11)

many years Chicago "raised itself by the bootstraps" after the great fire in 1871 by raising its street grades from five to nine feet.

Building the necessary roads and many bridges that were required has always been a great problem requiring the efforts of our best engineers. Streets were added, extended, widened and paved. There were constant demands for more and wider bridges. Each year solutions were proposed for the "traffic problem."

Early in this century a new form of transportation came into the picture—the gasoline buggy and all its later brood, the taxi, the truck and the bus. Chicago was already having plenty of traffic troubles in the downtown area with the thousands of horse drawn dray, delivery wagons, plus the trolley cars. But, with the advent of the automobile, "confusion was confounded."

When the streets and boulevards were laid out in the fast growing days of the City, few, if any thought about the automotive age. The streets of the golden gay nineties were simply too narrow for the avalanche of traffic brought in by the faster moving and more numerous automobiles, taxis and trucks.

The number of motor vehicles in Chicago had reached 100,000 in 1915 and people were beginning to realize that a new and important form of transportation was here to stay.

In the next six years the number of motor vehicles had doubled and there was a flurry of street building to provide better traffic ways. In five more years or by 1926 the number was doubled again, reaching the unbelievable total of 400,000. This brought the greatest activity in opening new streets and widening old ones that has ever been known. About $70,000,000 was spent for street improvements in 1927 alone. Of this amount $51,000,000 was in the form of special assessments and the rest was in bond issues and various taxes.

For a few years after this, street widening projects were in great favor. This gave some relief from the "traffic congestion" that was then becoming very acute but the added capacity was not being built as fast as the traffic was increasing. Engineers soon found that these widened streets were not doing the job as intended.

It was found that the addition of another main street on an already overcrowded pattern created many more intersections requiring traffic signal control and further obstruction and delay to traffic. We had reached the point of diminishing returns as far as surface streets were concerned.

Chicago had run out of money in 1931 and could scarcely finance any highway improvements for some time.

For many years after 1931, the only major improvement which added substantial capacity to our street system was the building of Lake Shore Drive by the Chicago Park District under the direction of Ralph Burke. This is a very beautiful and modern, high speed, high capacity and safe highway. It handles volumes as high as 120,000 vehicles per day on the North Drive. In my opinion this is the greatest highway that has ever been built. Drivers prove its value by driving many miles out of their normal course to use it. Other than this one major addition, our efforts were confined to increasing the capacity of our existing system by such means as we could devise, such as better pavements, curb setbacks, improved signal timing, parking restrictions, safety islands and removal of street car tracks.

Just because we could not build more traffic ways, however, was no sign that the traffic had not increased. From the 400,000 vehicles in 1926 we recovered from the depression and had reached 600,000 by 1939. We have recovered from World War II and are now above 800,000 vehicles or double the number in 1926. From the 100,000 or 1915 we have doubled not once, not twice, but *three times*. What an astonishing geometrical progression! Who can say when it will occur again.

Chicago now has 3,400 miles of improved streets of which about 850 miles form the major thoroughfare system. Traffic engineers estimate that this small mileage of streets carries more than seventy-five per cent of the total traffic. About 2 million people take approximately 4 million rides per day on this major thoroughfare system. In addition to its importance in the moving of people this system provides for nearly all of the highway transport of goods and nearly all of the retail trade is conducted along these streets.

After a thorough study of all street transportation by Charles DeLeuw, Wm. R. Matthews, A. J. Schafmayer and Philip Harrington a system of superhighways was recommended and the City Council in 1940 adopted a general plan entitled "Comprehensive System of Superhighways." This system included the existing and famous Outer Drive which had been developed by the Chicago Park

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South	17.0	84,000,000
Southeast	8.2	33,000,000
Crosstown	7.5	40,000,000
Wacker Drive Extension	.7	12,000,000
Additional Wacker Drive	.3	6,000,000
Total	67.0	$469,000,000

FIGURE 1

District along the lake front from Foster Avenue on the North to 47th Street on the South, and also included the existing Wacker Drive which had been developed as a double-decked street along a South bank of the Chicago River from Michigan Avenue to Lake Street.

Since its adoption this system has been reviewed thoroughly by the several city departments concerned with highway traffic, the Chicago Plan Commission, the Chicago Park District, the Chicago Regional Planning Association, the Cook County Highway Department, the Illinois Division of Highways, the United States Bureau of Public Roads, numerous civic organizations, the public and the City Council. This resulted in revisions to bring the plan up to date and to allow proper connections to county, state and federal routes.

The original system of superhighways at 1938 prices was estimated to cost about $205,000,000. Since then, additions to the system and increases in cost have resulted in a system comprised of sixty-seven miles of super road estimated to cost *$469,000,000.*

The present plan embraces the routes shown in Figure 1 with the mileage and estimated cost of each route.

These routes in the city form a part of a county-wide system of superhighways which is integrated with the state system of highways and the federal aid system. Because these superhighways are designed as a part of an over-all system, the other agencies are cooperating in their construction. By agreement the city, county and state will share equally the cost of the superhighways within the city, and the county and state will share equally the cost of the system within the county, but outside the city. The state will use its federal aid monies as part of its share, so there are actually four parties involved. These becomes five parties in some cases where the Chicago Park District or the Chicago Transit Authority is involved.

It is necessary to use the combined engineering skills and the combined funds of all of these agencies because of the magnitude of the work and the cost involved. Even with the sharing of the costs there are not sufficient funds in sight to finish the entire system in a reasonable time.

While the work involved and the cost of the superhighway system seems staggering, it is the only answer to the pressing need for substantially greater capacity, for increased speed and efficiency, and most important of all, for greater safety.

Offset against the money and effort required to complete the system are the tremendous benefits that will be brought to the City and its people. These benefits are:

1. The system will be used by 250,000 vehicles daily, which will travel in excess of one billion vehicle miles annually on the system.
2. Time saving due to higher speeds and the elimination of cross traffic with signal control is estimated at forty million man-hours annually.
3. The elimination of stopping and starting will result in more efficient car operation and reduce fuel consumption. The saving in fuel alone will amount to about five million dollars per year.
4. Due to the built-in safety of this system it is estimated that there will be one hundred fewer fatalities and four thousand fewer injuries in one year than would occur with the same amount of travel on the arterial street system of the City.

You may ask whether this superhighway system will solve our street traffic problem. My frank answer is no. I hope that the expressways can be built fast enough to absorb the steady increase in traffic which we are experiencing.

But the bulk of our traffic must still be carried by our major thoroughfare system. Engineers must continually study and strive to improve this system with intersection improvement, grade separations, coordinated signal timing, increased traffic and parking control, more one way streets and better illumination.

Air

Already the world's largest railroad center, Chicago is also destined to be one of the largest centers of aviation. In 1949, Chicago earned the distinction of being the first city known to accommodate more than 1,000 airplane arrivals and departures per day at its three municipally-owned airports: Midway, O'Hare Field and Meigs Field.

Ten major air lines serve the City. Together with five "feeder" passenger

(Continued on Page 14)

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(Continued from Page 13)

lines, three regular scheduled air freight and express lines and numerous non-scheduled lines, they already make the City the air hub of the Nation.

Midway is one of the busiest airports in the Nation, covering 617 acres. It has eight runways, which in 1951 handled a total of 4,953,000 passengers.

Meigs Field comprises 73 acres, and is designed for small and medium sized aircraft, being built on an island on the Lake Front off Grant Park.

O'Hare Field is destined to be one of the world's largest and most modern airports. It lies 18 miles northwest of the Loop and comprises 6,900 acres. Construction is following a master plan, which permits stage development. When designed transportation facilities are completed, Loop to airport via rail or expressway, will require about twenty minutes. The Northwest Route of our Comprehensive System of Superhighways will be the main expressway facility to the Loop. The estimated ultimate cost of the airport is placed at $75,000,000.

The finished airport contemplates ten runways, some as long as 9,400 feet; also a five-fingered, two story 94-gate terminal building, power house, service and cargo building, catering building and maintenance shops.

This latest form of transportation is offering some of the greatest opportunities in all fields of engineering.

The progress of all transportation, for the last 100 years, has depended on the skill and imagination of many engineers. The great challenge of the present and the greater challenges of the future is that this progress be maintained.

●

Duba Named Assistant Professor

John G. Duba, instructor of civil engineering at Illinois Institute of Technology and conference secretary of the National Conference on Industrial Hydraulics, has been promoted to the rank of assistant professor at Illinois Tech, effective September 1.

He is an associate member of WSE.

John T. Rettaliata, president of Illinois Tech, made the announcement on September 7.

Duba joined the faculty of the Institute as an instructor of civil engineering in 1949. He had been an instructor at the University of Missouri, while completing work toward his master's degree.

A native of Norfolk, Virginia, Duba attended Rogers high school, Newport, Rhode Island. He attended Rhode Island State college from 1940 to 1943, and after service with the armed forces attended Washington University where he was awarded a bachelor's degree in 1947.

Duba, 29, is married and lives at 107 Dogwood street, Park Forest, Illinois.

The eighth annual Industrial Hydraulics conference, sponsored by Illinois Tech, was held in Chicago at the Sherman Hotel September 4 and 5. The conference was part of the Centennial of Engineering program.

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The Sign is Out

(Continued from Page 6)

though this is the mid-20th century, you are pioneering in careers for women engineers just as your "sisters" did many years ago in medicine and law.

I feel that the influence you could have in encouraging qualified young women—particularly of high school age—to take up engineering careers would be much greater than any group of men would have. In doing this, you would be performing a tremendously valuable service, both to our profession and to the public who ultimately receives the benefit of effective engineering talent.

I predict that you will not have to do the job alone. I believe that management—as a matter of good business—will play its part in encouraging capable young women to train for the profession. And there are some very practical ways in which management *can* help:

First, of course, is for them to look upon the employment of women engineers from the standpoint of the calibre of job they can do rather than to discount their potentialities simply because they are women.

And second, management, by giving proper recognition to capable women engineers already in their employ, can help tremendously in overcoming the idea that women are less suited for engineering careers than are men.

I know that in some of the fine addresses to follow, both this afternoon and tomorrow, the Society of Women Engineers' speakers will present the interesting story of successful women engineers in greater detail. They will describe, I am sure, more adequately than I could, the aims and ambitions of women engineers, their backgrounds and, most of all, how they can make significant contributions to the development of engineering in our country which is so greatly in need of sound engineering talent.

Speaking for myself, and I hope for a great many other employers of engineers, I can say "The Welcome Sign is Out for Women Engineers." There is a place for them in Industry and a need for their talents in shaping America's technological future.

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(Continued from Page 8)

Harrison Sreet and a part of the 22nd Street pumping station requirements.

In 1896, the City constructed the Carter H. Harrison crib and intakes. The work included a 14,000 foot lake tunnel serving the Chicago Avenue Station and land extensions to Central Avenue and Springfield Avenue stations which were built near the west city limits to serve the rapidly expanding requirements to the west.

The Edward F. Dunne crib and tunnel on the south side were completed in October, 1911, to supplement the old Hyde Park crib and intake tunnel. This new tunnel was a 14 foot rock tunnel with its centerline 153 feet below city datum with land sections going to the 68th Street, Roseland and Western Avenue stations.

The William E. Dever crib and 16 foot diameter tunnel to Chicago Avenue and Springfield and Central Avenue stations were completed in 1940. A branch also extends to the new Cermak station.

The Chicago tunnel system now has a total capacity of about two billion gallons daily. With the construction of filtration facilities which can satisfactorily purify water drawn through near shore posts, it is not likely that any more long lake intakes will be constructed at Chicago.

At the present time Chicago is divided into three tunnel districts each serving several pumping stations. The north district supply from the Lakeview crib includes the Lakeview, Thomas Jefferson and Mayfair pumping stations serving the area in general north of Fullerton Avenue and the suburbs to the northwest. The central district taking water from the Carter H. Harrison and William E. Dever cribs supplies Chicago Avenue, Cermak, Springfield Avenue, and Central Park Avenue stations with a branch to 22nd Street. This area extends from the lake to the westerly suburbs and from Fullerton Avenue to 39th Street.

The south tunnel district embraces the entire area to the south and southwest of Chicago with intake from the Edward F. Dunne crib serving the 68th Street, Roseland and Western Avenue main pumping stations.

PUMPING STATIONS

The original Chicago Avenue station with its single 25 H.P. engine driven pump with a capacity of less than 1 MGD has during the century expanded to a total of twelve pumping stations with a total installed capacity of 2,635 MGD. Of these stations seven with a total installed capacity of 1,645 MGD are wholly steam operated, four are wholly motor operated and a fifth, the Chicago Avenue station, is motor operated with steam reserve. The division as between steam and electric operation is maintained at approximately a constant ratio of two-thirds steam to one-third electricity as a factor of safety in guaranteeing continuity of service. The Chicago Water Works operates without any elevated storage and pressure would drop immediately upon any stoppage of service.

Originally all pumps were steam operated. The first four pumping units installed by the City were of the simple condensing vertical working beam type having capacities of 8, 13, 18, and 36 MGD respectively. These units operated at very low speed of 10½ RPM per minute at a 9 foot stroke or an equivalent piston speed of 189 feet per minute. The water ends were located entirely below water level in a wet well.

In 1876 when the new 22nd Street pumping station was built the pumping units were compound condensing vertical working beam engines with the water ends removed from the wet well and connected thereto by a suction pipe. These units under test and when operating at a rate of 15 MGD against 160 feet developed a duty of 90 million foot pounds per 100 pounds of Pennsylvania anthracite. These units remained in service until 1921.

The next improvement in pumping equipment was through the installation of horizontal compounds first introduced at the Chicago Avenue station in 1887. They developed about 100 million foot pounds duty per 100 pounds of anthracite coal. These units operated with a vacuum of 26".

The next change in pumping equipment was the introduction of vertical triple expansion condensing units first installed at Harrison and 14th Street stations about 1891. Three units of this type are still serviceable at the 14th Street station although it is only rarely that any equipment in that station is now used.

The most modern types of vertical triple expansion condensing units were installed at Lakeview, Roseland and the Mayfair stations beginning about 1912. These units developed a duty of from 160 to 200 million foot pounds per 1,000 pounds of steam. These units operated on higher steam pressure and superheat.

The next development in steam driven equipment was the use of turbine driven geared centrifugal pumping units, the carliest of which were installed in the Chicago Water Works about 1922. This equipment operates with a duty of from 160 to 200 million foot pounds. All steam driven pumping equipment installed in the Chicago Water Works for the past thirty years has been of this type.

During this period of evolution, pumping speeds have changed from the original 10½ RPM reciprocating units to 710 RPM centrifugal driven through

(Continued on Page 16)

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(Continued from Page 15)

reduction glass by steam turbines operating at several thousand RPM. A modern 80 MGD turbo centrifugal pump requires much less space than a 15 MGD vertical triple or cross compound unit. It will have substantially as high a steam duty and can be purchased at but a comparatively small fraction of the cost of the older types. The last vertical triple expansion pump installed in the Chicago system started operation in 1918.

During this period of complete change in types of steam pumps at Chicago, steam pressures have increased from 30 pounds to 300 pounds per square inch and superheat up to 225°F. has been adopted. Boiler installations progressed from the internally fired Scotch marine boilers of small size to modern water tube boilers of 650 H.P.

Modern facilities for handling coal and ash have supplanted the original crude facilities for hand firing.

Beginning in 1918 the first electric motor driven pumps were installed. Gradually installations of this type have taken over in stations located in the higher class residential districts including Chicago Avenue, 68th Street and the Thomas Jefferson stations. The largest electrically operated station is the 300 MGD Cermak station built in 1935 to replace the Harrison Street station and, in large part, the 22nd Street station.

PURIFICATION FACILITIES

Water drawn from Lake Michigan and delivered to the distribution system at Chicago received no purification treatment prior to 1912. The typhoid death rate was frequently high, reaching a peak of 173.8 per hundred thousand population in the year 1891. For the ten years prior to the opening of the drainage canal the typhoid mortality rate at Chicago average 66.8 per hundred thousand.

Following the opening of the drainage canal and further influenced by the opening of the intercepters to divert the sewage from the lake during the next decade, the typhoid death rate dropped to an average of 22.7 per hundred thousand population for the ten years from 1900 to 1910. Beginning in 1912 chlorination of the water was started and subsequent to 1917 all water has been chlorinated. Following chlorination, the typhoid fever mortality rate averaged approximately one per hundred thousand population which has since been still further reduced to about one in four hundred thousand.

The lake water is normally relatively clear but at times, due largely to wind action, the turbidity delivered to the distribution system is quite objectionable, reaching a peak in excess 100 ppm at rare intervals of relatively short duration. Filtration has been actively considered from the early 1920's.

In 1927 the City of Chicago set up an experimental filtration plant located near the 68th Street pumping station. This plant was operated under the direction of John R. Baylis for approximately twenty years during which period extensive experimental work was carried on relative to practicable procedures for filtration of the Lake Michigan water.

Beginning about 1930 and continuing intermittently for nearly a decade drawings were made in preparation for the construction of a filtration plant to serve the south district of Chicago. Construction was finally started on a plant having a rated capacity of 320 MGD in 1939. Due in part to the foreign situation, later much accentuated by the United States' active participation in World War II and the resulting shortages in construction materials and labor, the filtration plant was not completed until after the end of World War II. The South District filtration plant started operations as a coagulation plant without filters in August, 1945, and operated as such for approximately a year and a half. Since February, 1947, all water delivered to the South District of Chicago has been filtered.

The availability of filtered water in the South District led to demand from other sections of the city for improved water quality. As a result of a referendum in which an overwhelming majority of the people expressed their desire for filtered water, a study was made of the most practicable method of supplying the two-thirds of the city not then supplied with filtered water. The report of the consultants (Alvord, Burdick & Howson and Greeley & Hansen) recommended a single plant to serve the

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north and central tunnel district areas, the plant to have a capacity of 950 MGD and to be located on made land occupying an area of approximately 60 acres to be built within a cofferdam immediately north of the Navy Pier and inside of the outer break water. This recommendation was approved after lengthy hearings and construction was started by letting the first contract for the $7,000,000 cofferdam enclosure early in 1952. The total estimated cost is $85,000,000. With the completion of this plant, all Chicago and those suburbs taking water from Chicago will be furnished with filtered water of the highest quality.

DISTRIBUTION SYSTEM

The water distribution system of Chicago has grown from the 2 miles of wooden mains acquired in 1851 to more than 4,000 miles of pipe 100 years later. The present pipe system includes all sizes up through 54″ in diameter. Until about World War II all distribution pipe in Chicago had been of cast iron with lead joints. Since that time, for sizes 36″ and larger, reinforced concrete pipe has been quite generally used.

The mileage of pipe above given is exclusive of that in the suburbs through which Chicago water is distributed. These suburban systems include an additional 1000 miles.

As of the present time there are approximately 440,000 individual services taking water from the Chicago system, of which approximately 122,000 (or 27.8%) are metered. The percentage of services metered has remained substantially constant over the past 2 decades.

WATER USE

The Chicago Water Works is "big business." A former mayor erected billboards stating that Chicago pumped more water than any city in the world. At that time it might appropriately have been stated that Chicago wasted more water than any city in the world. Since that time conditions have materially changed. The City of Chicago in 1906 set up a Pitometer Survey Division to detect waste. Although many years were required to show results, the accomplishments as evidenced by the past 20 years reflect the excellent work of that Division and of those responsible for water works operations in Chicago in the reduction of waste.

These results are strikingly illustrated by the following figures:

Although the total pumpage to the distribution system in 1950 (950,789,000 gallons per day) was 1½% less than in 1940 (963,776,000 gallons per day), the metered sales of water during that period increased 28% and the unmetered water decreased 21%. The revenue from metered sales increased 46%.

Expressed another way, the city realized $5,000,000 per year from water now sold which formerly was "unaccounted for." The leak surveys, improved maintenance of motors, and general improvement in operations and management contribute to this excellent showing, in which the City may well take pride.

During this period, air conditioning has become a serious factor on peak loads although it is a minor factor from the revenue standpoint. The air conditioning equipment now using Chicago water has a capacity requirement of more than 300 million gallons per day, which is 20% of the peak day's use and 30% of the average annual use. This peak use, which is of very short duration, usually comes on at a time when other uses are also at a peak. It taxes both the water supply and the sewage disposal facilities. The problem of its transportation through the sewers in the downtown area is particularly serious.

Probably few people realize that the Chicago Water Works, as measured by the tonnage of its product, far exceeds any other industry in the Chicago area. Its output averages over 4 million tons per day. It is the city's largest transportation system. The water is taken from the lake and transported an average of approximately 10 miles, lifted approximately 150 feet in elevation and delivered to the consumers for less than 1½c per ton. Water is not only the greatest in tonnage but the lowest in cost per ton of all commodities.

At this centennial time, it is pertinent to refer to the change in conditions

(Continued on Page 18)

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(Continued from Page 17)

over the century. Records of construction of a water works a little over a century ago disclose that common labor at that time received 75 cents per day, the superintendent received $1 per day, and chestnut logs suitable for boring for pipe were available at 9 cents per foot, and trenching and backfill, depending upon location, varied from 6 to 12 cents per lineal foot. The average cost of water per consumer was $6 per year. A laboring man one hundred years ago therefore worked eight days in order to provide his family with service from the public water supply for a year. At the present time, the average laboring man in the United States works but a single day to provide his family with a much better and more adequate water supply for the year.

In one month the tonnage of water handled by the Chicago Water Works equals that of the entire annual steel production capacity of the United States. It equals the tonnage passing through either the Panama or Suez canals every week.

Without an adequate water supply, Chicago as we know it would not be here. Chicago is fortunate in having Lake Michigan at its door which, as compared to New York, has made it possible to provide facilities with greater capacity at approximately one-fourth the capital expenditure.

Chicago has expended approximately $225,000,000 for its water works property. Of that amount about 80% has been paid for by the users from water rates. So that the outstanding indebtedness of the Chicago Water Works is only 20% of the total amount which has been invested in its construction.

Chicago is proud of its water works. Its contribution toward improved health and sanitation, as evidenced by the practical elimination of typhoid, have been tremendous. Its facilities and operation have truly made Chicago a better place in which to live.

We salute those who through the century have provided the foresight, ingenuity, engineering and management which have resulted in the Chicago Water Works making its important contributions to water supply progress, both in Chicago and nationally.

●

Report on SWE

(Continued from Page 10)

Consulting Engineer, Toronto, Ontario, Canada.

"Evaluating Engineering Abilities", Mary P. Blade, MS (IE), Professor, The Cooper Union, New York, N.Y.

"Health Protection in the Field of Atomic Energy", Evelyn Jetter, BEE, Electronics Engineer, U.S. Atomic Energy Commission, New York.

A question period will follow.

Miss Elizabeth M. G. MacGill, Toronto, Canada, the SWE afternoon guest speaker, created great interest and discussion on the question of jet transportation, resulting from her talk on "The Initiative in Airliner Design" which is summarized as follows:

The commercial exploitation of the aircraft gas turbine engine and the introduction of turbine-powered airliners into scheduled service is described as the challenge facing commercial aviation today. The American design coup that produced the familiar airliner types and ushered in 20 years of American airliner supremacy is discussed. Statistics are quoted to show that today the United Kingdom alone is in production on turbine-engined airliners, which suggests a parallel with the American coup. The United Kingdom is stated to have a 3-to-5-year start in the commercial exploitation of this new type, and a good chance of acquiring the airliner design and market leadership. Lag in the development of turbine-engined airliners in North America is commented upon. The Canadian aviation defense programme is outlined, and is cleared of responsibility for the lag in Canada, which is attributed to loss of initiative. This is ascribed to 13 years of concentration on military projects, and the influence of military attitudes and procedures. Further deterioration is anticipated because military and civilian research aims, once roughly identical, now diverge, the R.C.A.F. Research and Development programme being outlined to exemplify the trend. The inference is drawn that the design initiative has passed to the United Kingdom because she alone had the will and resource to undertake the commercial exploitation of the aircraft gas turbine engine.

The SWE convention was climaxed

by a banquet held Friday evening with the following program.

RECEPTION and BANQUET

6 O'clock, PM, WSE Headquarters Lounge, 6th Fl. and Dining Room—5th Floor.

Chairman

Dot Merrill, Chairman Chgo. Sec. & Director of Society of Women Engineers; Director, Western Society of Engineers; Chief Engineer, Merrill and Company, Chicago, Illinois.

Introductions

Lillian G. Murad, BChE., *President Society of Women Engineers;* Vice-President, Murad Textile Print Works, Inc., New York, N.Y.

Ovid W. Eshbach, President, Western Society of Engineers; Dean of Engineering, Northwestern Univ. Technological Institute, Evanston, Illinois.

Speaker

"Some Problems That Challenge Engineers Today", Dr. Lillian M. Gilbreth, Industrial Engineer, President Gilbreth, Inc., Montclair, N.J.

Miss Lillian Murad reviewed the organization and growth of the SWE and predicted a glowing and successful future.

Dean Eshbach stressed the fact that the engineer's advancement in science was paced by the moral applications of his efforts.

Dr. Lillian Gilbreth, with the wisdom that comes with the wonderful full life of experience that she has had as an engineer and mother of a wonderful family, said that "engineers are pledged to use the forces of nature and human nature for the benefit of mankind." Also, "it is the responsibility of women engineers to see that adequate women are recruited, trained, and given opportunities to use their skill" and "to see that the increasing demand for women in the profession is properly met." She stressed the need for engineers to find their place in world and national affairs, and further urged a regeneration of the appreciation of spiritual values which must first begin in the home, there being no conflict between science and religion. In conclusion she said, "we must widen our horizons and in our professional work place more emphasis on the spiritual elements of life."

The Chicago meeting of the Society of Women Engineers was terminated with a meeting of the Board of Directors on Saturday, September 6.

WSE Resumes Weekly Noon Luncheons

WSE's weekly noon luncheon meetings are resuming. The first one, dated Wednesday, October 8, lists John D. Cannady as speaker, and the subject as "The Sun's Big Son."

These Wednesday noon luncheons begin at 12:15 p.m. The meetings break up promptly at 1:30 p.m. Speakers and topics will be announced periodically.

For short, interesting and thought-provoking talks, mark every Wednesday on your calendar in red, and come to lunch at WSE.

Urges Women To Seek Careers In Engineering

More women should seek engineering opportunities, according to Dr. John T. Rettaliata, president of Illinois Institute of Technology in Chicago.

"They can well fill certain engineering and scientific fields, and they constitute the largest single source for new, additional, and competent engineering students," he wrote in a letter to Miss Lillian G. Murad of New York City, president of the Society of Women Engineers, that was read September 4 at the Society's first Chicago meeting. He pointed out that partial solution to the nation's current engineering manpower shortage lies in woman power.

"Nearly one-third of the women of America are now in occupations outside their homes. They have become a tremendous factor in our civilian labor force and a most necessary one to meet current defense and expanding economy needs," he wrote.

The letter congratulated the society's members "for the contributions they are making to the engineering profession. Their leadership is demonstrating that women can be good engineers." He asked the members to encourage other women to enter the profession.

Dr. Rettaliata invited the group to visit "the modern Technology Center that the Illinois Institute of Technology is developing on 96 recently-reclaimed acres 10 minutes south of the Loop."

William V. Kahler, a member of Illinois Tech's board of trustees and president of the Illinois Bell Telephone Co., addressed the group September 5 on "The Welcome Sign is Out for Women Engineers."

Fall Dinner Set for November 17

WSE's annual Fall Dinner will be held November 17, at the Furniture Club of America. The speaker will be announced in the next issue.

But remember, keep open this important date, Monday, November 17.

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Reviews of Technical Books

Available at WSE Headquarters

Ultrahigh Frequencies

UHF Practices and Principles by Allan Lytel, John F. Rider Publisher, Inc., 480 Canal Street, New York, N.Y. First Edition 1952—390 pages $6.60.

Although the transmission and reception of ultra-high frequence radio waves on an experimental basis can be traced some sixty years to Hertz, its commercial use in police and fire departments, amateur radio, taxicab and truck services, radio navigation, etc., is comparatively recent. Now that the technical world is becoming aware of the possibilities of UHF and since it does not behave in the same manner as the lower frequencies, radio and TV service technicians and students should possess a knowledge of the special techniques, concepts, and circuits employed. This book, combining the theory and applications of UHF is a successful attempt to clarify the subject. It provides a fundamental background for understanding transmitting and receiving circuits and equipment including antennas, oscillators, transmission lines and wave guides.

A section of questions is included at the end of each chapter as a means of reviewing the principal highlights. Also an extensive bibliography is given to help the reader locate additional information on the subject.

Engineers, seeking the latest practices in this specialized field, will find a great quantity of new information to bring them up to date.

H.P.H., W.S.E.

Television

TV Troubleshooting and Repair Guide Book by Robert G. Middleton, John F. Rider Publisher, Inc., 480 Canal Street, New York, N. Y. First Edition 1952—204 pages. $3.90.

This new, practical, easy-to-use book was written for the TV servicing personnel. It tells how to detect and correct TV receiver troubles. The presentation is greatly enhanced by the hundreds of wave form diagrams, picture tube patterns, and test equipment setups. Systematized tabulations of picture faults further aid in the rapid location of trouble. Theoretical explanations are eliminated as far as possible.

For the man with normal intelligence, ability, and interest the information contained in this book will be of considerable assistance in helping solve TV repair problems.

It is well indexed.

H.P.H., W.S.E.

Portland Cement Appoints Two

Miles D. Catton, Director of Development of the Portland Cement Association since 1949, has been appointed Assistant to the Vice-President for Research and Development effective September 1, according to an announcement by A. Allan Bates, Vice-President for Research and Development. He succeeds H. F. Gonnerman, who retired effective the same date after 30 years of active service with the Association.

Succeeding Mr. Catton as Director of Development is Douglas McHenry, previously Administrative Assistant to Dr. Bates.

Mr. Catton is best known as the author of numerous scientific papers and technical brochures on soil-cement construction and for his pioneering work in this field. Between 1935 and 1940, laboratory and field studies directed by him on the feasibility of scientific control of mixtures of native soil and portland cement were in large measure responsible for the development of this low-cost paving material.

Mr. McHenry joined the Association staff in April of 1952 as Administrative Assistant to Dr. Bates after eleven years of service with the U. S. Bureau of Reclamation in Denver, where he was head of the Structural Development Section and later chief of its Concrete Laboratory Section. He is nationally known in engineering circles as the author of many notable papers on concrete technology and structural research.

In 1943 he received the Sanford E. Thompson Award of the American Society for Testing Materials, and in 1944 the Telford Award of the Institution of Civil Engineers of Great Britain.

Crerar Library
Notes and News

The Chicago Branch Headquarters of the Office of Naval Research is the latest addition to the science and engineering center at 84-86 East Randolph Street. Scheduled for October 10, the Office of Naval Research will occupy the entire 10th floor of the Library Building. The Chicago Branch Office, headed by Captain Harry Dodson, consists of scientific, contract administration, patent, training devices, and administrative staffs operating throughout the 8th and 9th Naval Districts. The addition of this important research agency to the Crerar group is in harmony with the Library's policy of preferring tenants whose members make active use of the Library's collections and study facilities.

Remodelling of the 9th, 11th, 12th and 13th floor of the Library Building has made possible reallocation of library departments formerly occupying the 10th floor. The Acquisitions and Cataloging staffs are located on the north half of the 11th floor adjacent to the Administrative Offices, and the library bindery has been set up in new quarters on the 13th floor. Scheduled for later development is a Board room and rare book room in the southwest corner of the 12th floor. The remainder of this floor is occupied by the Medical Department.

* * *

The exhibit for BOOKS FOR ENGINEERS which was opened on the 4th floor of the Library Building during the Centennial of Engineering proved to be very popular with a large number of visiting engineers from abroad. 149 such engineers, from eighteen countries, spent considerable time studying the American engineering publications on exhibit.

* * *

CRERAR METALS ABSTRACTS is a new service venture of Research Information Service, initiated in August. The service is designed to report promptly, with informative abstracts, complete coverage of current technical literature for a selected group of metals on which there is expanding research interest in industry and government. The August issue covered titanium, zirconium, hafnium and the rare earths; the September issue added molybdenum to this group. Other metals will be added as the interest demands. The literature to be covered will include all relevant items received in the Library from the 15th of one month to the 15th of the month in which the abstract bulletin will appear. Publication date each month is set for the 26th.

ASTM Promotes Two Officers

The American Society for Testing Materials through its President, Harold L. Maxwell, E. I. DuPont de Nemours and Co., announced today the election of Robert J. Painter as Executive Secretary and of Raymond E. Hess as Associate Executive Secretary.

The promotions were made by the ASTM Board of Directors at its meeting on September 16.

Hess has been Technical Secretary and Editor of this national technical society of some ten thousand members for many years. Painter most recently has been Treasurer and Assistant Secretary. Both are located at the ASTM National Headquarters Building on Philadelphia's Parkway.

The Society at its New York Meeting in June this year commemorated 50 years of operations in materials research and standards work.

Painter is a graduate with a degree of Civil Engineer from Rensselaer Polytechnic Institute, and Hess also is a Civil Engineering graduate from the University of Pennsylvania.

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OVER THE MANAGER'S DESK

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T-9255 ASSOCIATE or ASSISTANT PROF. ME Duties: to teach machine tool theory and practice and have charge of research in modern well equipped laboratory. Immediate opening or February, 1953. Salary: $4000-$7000 for nine months. Loc.: Missouri.

R-9256 FIELD ENGINEER (Promotion) CE. Age: up to 30. One yr. plus exp. in highway construction, inspection or soils work. Knowledge of soils or highways. Duties, assist in promotion and technical servicing of soil cement streets, roads and airports. Contact builders, construction engineers and users. Salary: $400-$525 per month. Employer may negotiate the fee. Travel 50% of time. Location: Chicago.

R-9257 SALES ENGINEER—Some mechanical engineering schooling. Age: to 30. Knowledge of power engine application. Duties: sales engineer contacting consulting engineers and municipalities, sales of gasoline and natural gas engine installations. Headquarters: Chicago. Travel 50% of time. Salary: $6000 per year plus. Car Required.

R-9258 PRODUCT DESIGNER * some mechanical engineering training. Age: to 30. Three yrs. plus exp. in product and mechanical design work. Duties: design towel cabinets and special machinery such as paper towel converting machinery and special industrial laundry equipment. Salary: to $400 per month. Employer will pay fee. Location: Chicago.

R-9259 RECENT GRADUATES—Mechanical Duties: training program in large mail order house, eventually work in as buyers, factory supervisors or supervisors of laboratory. Must have good personality. Salary $350 per month. Employer will pay fee. Location: Chicago.

R-9260 DRAFTSMEN, mechanical schooling. Duties: drafting on materials handling equipment, ovens, conveyors, etc. May have to go out in field from time to time taking measurements on equipment installations. Salary to $100 per week. Loc.: Chgo. Employer will negotiate fee.

T-9261(a) DEVELOPMENT OR PROJECT ENGINEER. Grad Mechanical Engr. Age: 25-40. 3-5 yrs. exp. aircraft fuel booster pumps and pumping of high vapor pressure fuels. Knowledge of centrifugal pumps. Duties: to be responsible for the engineering design and development of fuel pumps for operation at the fuel vapor pressure of fluid. Company manufactures aircraft pumps. Salary $4000-$6000. Location: Ohio.

T-9261(b) CHIEF DESIGN ENGINEER—Grad. Mech. Engineer desirable. Age: 30-45. Eight yrs. exp. in aircraft accessories design. Knowledge of fuel and oil, pumps—rotary. Duties: to take complete charge of design and drafting section and be responsible for all layout and detail design. For a manufacturer of pumps. Salary $6000-$7000. Location: Ohio.

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SALES ENGR. ME 32 Five yrs. selling transmission equipment, contacting some small O.E.M. accounts as well as machinery distributors. One and one half yrs. as buyer, bought machinery of all types. $7000 Midwest 463 MW.

DEVELOPMENT MS. Chem. 42 Three and one half yrs. Materials Engr., testing and evaluation of metals. Ten yrs. Research in lab. and pilot plant in metal finishing. Four and one half yrs. expediting technical research and engrg. information. Midwest $9000 464 MW.

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PATENT ENGR. LLB&ENG. 27 Six mos. writing patent applications and conducting searches. Some sales experience. Midwest $4000 466 MW.

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SALES ENGR. ME 29 Three and one half yrs. sold refrigeration, heating & air conditioning equipment. Ten mos. designed industrial heating and air conditioning process systems. Midwest $7500 468 MW.

SALES ENGR. ME 27 Twenty-seven mos. Sales Office Engr. handling pumps, blowers, engines, etc. Doing analysis work to select equipment conforming to specifications. $4800 Midwest 469 MW.

CONSTR. or PLANT ENGR. ME 29 Four yrs. maintenance of steam distribution systems: testing and instrumentation work. One and one half yrs. erection of steam power plants. Midwest $5000 470 MW.

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Report Available

Available at WSE headquarters free of charge are a number of copies of "Statement of Operations, Department of Buildings, City of Chicago, 1952."

This is a report by Roy T. Christiansen, Commissioner of Buildings, put out to give to the people of Chicago information about one of the important governmental departments of the City.

Chapter headings of the 32 page booklet are:

What does the Building Department do?
How does the Department's work arise?
How is the Department's work handled?
What is the organization of the Department?
What is the Department's work record?
What is the Department's financial record?
What has been the progress of the Department?
What are the Department's plans for the future?

The report is well illustrated with colored charts, graphs and sketches.

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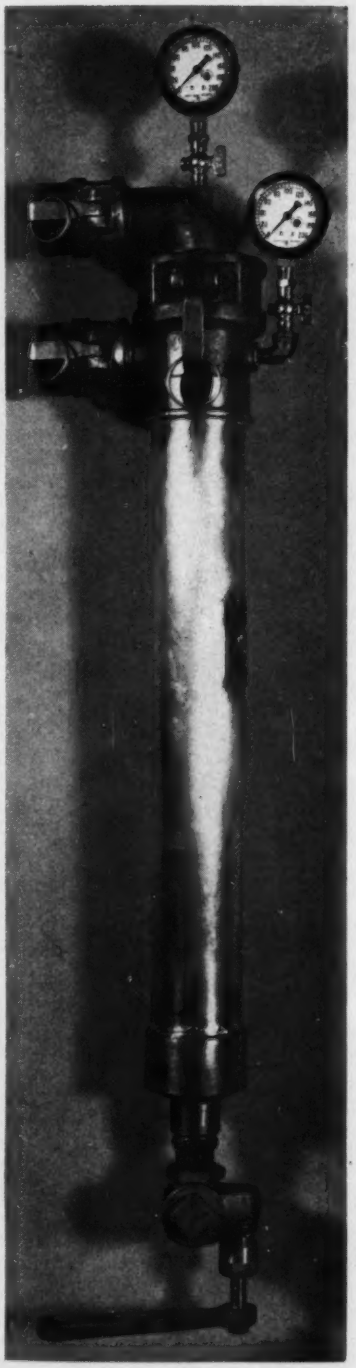

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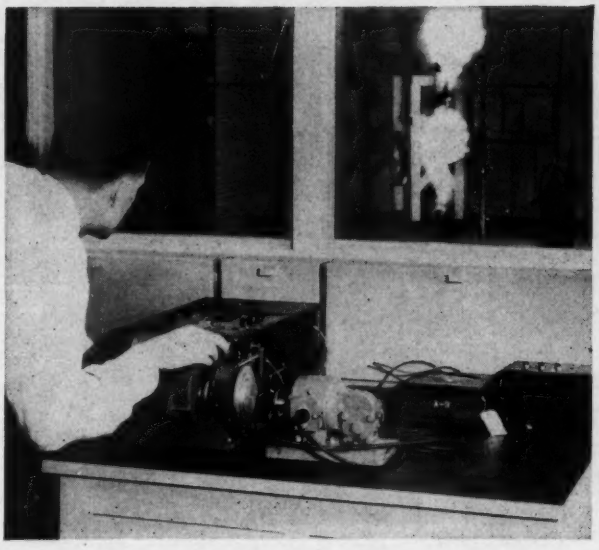
122 South Michigan Ave. • Chicago 3, Illinois
HArrison 7-0388



Research in L-M's short circuit laboratory—"KNOW-HOUSE." Non-destructive testing of L-M products is performed in open test areas. To the right of the fuse cutout here under test is located a reinforced steel and concrete test cell for testing to destruction. Photography, high-speed motion pictures and magnetic and cathode ray oscillograms play an important part in both types of testing.

L-M RESEARCH
is the basis for
L-M PROGRESS

Line Material makes research an important part of its program, because upon research is based the continuous development of new and better products.

This is a principle that we *practice*, as indicated by the number of L-M laboratories. There are, for example, two photometric laboratories, two high-voltage surge laboratories, a fuse laboratory, three high-potential and radio test laboratories, four mechanical and general laboratories, a short circuit laboratory, an oil circuit breaker laboratory, chemical laboratories, and others.

Here, in a creative atmosphere, are developed the many L-M "firsts" in the electrical distribution industry that help the utility companies bring you safe, economical, unfailing electric power. . . . Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

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LINE MATERIAL
Research and Development

Completely tested and coordinated electrical equipment that brings electric power to home, farm, and factory.

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TERRITORIAL INFORMATION DEPARTMENT

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